



## Huntington Power Plant

6 miles west of Huntington, Utah on Hwy. 31  
P.O. Box 680  
Huntington, Utah 84528

February 22, 2017

Mr. Bryce Bird, Director  
Utah Department of Environmental Quality  
Division of Air Quality  
195 North 1950 West  
P.O. Box 144820  
Salt Lake City, UT 84114-4820

**RE: 1st Quarter, 2017 Particulate Matter Compliance Test Report - 40 CFR 63 SubPart UUUUU,  
Huntington Power Plant Unit 1 and Unit 2 (Title V Permit #1501001004)**

Dear Mr. Bird,

In accordance with Title V Permit Condition II.B.3.f.1(b) and 40 CFR §63.10021(d) the Huntington Power Plant submits these 1st Quarter 2017 Particulate Matter (PM) Compliance Test Reports for Unit 1 and Unit 2. 40 CFR §63.10031(f)(6) requires the submittal of compliance test results that were generated prior to April 16, 2017. This submittal is intended to satisfy the report submittal for Huntington Unit 1 and Unit 2, and includes the portable document format (PDF) report that is submitted electronically via the Emissions Collection and Monitoring Plan System (ECMPS).

The summary results of the 1st Quarter 2017 PM test results are:

Unit	Emission rate (lb/mmBtu)
1	0.006
2	0.006

I am authorized to make this submission on behalf of the owners and operators of the affected source or affected units for which the submission is made. I certify under penalty of law that I have personally examined, and am familiar with, the statements and information submitted in this document and all its attachments. Based on my inquiry of those individuals with primary responsibility for obtaining the information, I certify that the statements and information are to the best of my knowledge and belief true, accurate, and complete. I am aware that there are significant penalties for submitting false statements and information, or omitting statements and information, including the possibility of fine or imprisonment.

Should you have any questions regarding this information, please contact Richard Neilson, Huntington Power Plant Environmental Engineer at (435) 687-4334 or me at (435) 687-4211.

Sincerely,

Darrell Cunningham  
Managing Director and Responsible Official, Huntington Plant

Enclosures: Emissions Testing Report for PacifiCorp Huntington Unit 1 – Particulate Matter Compliance Testing  
Emissions Testing Report for PacifiCorp Huntington Unit 2 – Particulate Matter Compliance Testing

cc: David Barnhisel  
Steve Jensen  
Michael Stovern, USEPA Region VIII, w/enclosures, by electronic communication



Emissions Testing Report for PacifiCorp  
Huntington Unit 2  
Huntington, Utah

Particulate Matter Compliance Testing

40 CFR Part 63, Subpart UUUUU

Test Date: February 8, 2017

Project Code PC17-0001.3

5160 Parfet Street  
Suite A3  
Wheat Ridge, CO 80033



Office (303) 495-3936  
Toll Free (800) 984-9883  
Fax (888) 605-0243  
[www.stacktest.us](http://www.stacktest.us)

## Certification Statement

I certify that all field data were acquired under my direction in accordance with a system designed to assure data quality. Based on reasonable inquiry, the information submitted is to the best of my knowledge true, accurate and complete.

A handwritten signature in black ink, appearing to read "Andrew Bruning".

Andrew Bruning  
Senior Project Manager  
Emissions Measurement Company

I certify that this document and all attachments were prepared under my direction in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on reasonable inquiry, the information submitted is to the best of my knowledge true, accurate and complete.

A handwritten signature in black ink, appearing to read "Matthew Parks".

Matthew Parks  
Technical Director  
Emissions Measurement Company

## **Executive Summary**

EMCo was contracted by PacifiCorp to conduct compliance testing at the Huntington Power Plant near Huntington, Utah. Testing was performed to determine emission rates of particulate matter (PM) from the exhaust stack of Huntington Unit 2. Compliance test results are summarized in the table below; detailed test results are given in the following report.

<b>PacifiCorp</b> <b>Huntington Power Plant</b> <b>PM Compliance Test Results Summary</b>						
<b>Source</b>	<b>Parameter</b>	<b>Date</b>	<b>Average Value</b>	<b>Emission Limit</b>		
Huntington Unit 2	Filterable Particulate Matter	2/8/2017	0.006	0.030 lb/mmBtu		
			0.07	0.30 lb/MW-hr		
Each result is the average of three two-hour test runs.						
Abbreviations: lb/mmBtu: pounds per million British thermal units lb/MW-hr: pounds per megawatt hour						



## **Introduction**

EMCo was contracted by PacifiCorp to conduct source testing services at the Huntington Power Plant near Huntington, Utah. The Huntington Plant comprises two pulverized coal-fired boilers. Huntington Unit #2 is equipped with low-NO<sub>x</sub> burners and overfire air for NO<sub>x</sub> control, an FGD scrubber for SO<sub>2</sub> control and pulse-jet fabric filters for PM control. Testing was conducted in accordance with the requirements of 40 CFR Part 63 Subpart UUUUU, National Emission Standards for Hazardous Air Pollutants (NESHAP): Coal- and Oil-Fired Electric Utility Steam Generating Units.

Contact information for the project is listed in the table below.

Contact	Affiliation	Telephone	E-mail
Frank Zampedri Environmental Analyst	PacifiCorp	(801) 220-2169	frank.zampedri@pacificorp.com
Richard Neilson Environmental Engineer		(435) 687-4334	richard.neilson@pacificorp.com
Rob Leishman Environmental Scientist	UDEQ	(801) 536-4438	rleishman@utah.gov
Andrew Bruning Senior Project Manager	EMCo	(303) 810-2168	abruning@stacktest.us

## **Scope of Work**

Testing was performed to determine concentrations and mass emission rates of particulate matter (PM) for comparison to the applicable emission limits listed in the table below.

Source	Regulation	Parameter	Emission Limit
Huntington Unit 2	NESHAP UUUUU	PM (lb/mmBtu)	0.030 lb/mmBtu
		PM (lb/MW-hr)	0.30 lb/MW-hr
<b>Abbreviations:</b> lb/mmBtu: pounds per million British thermal units lb/MW-hr: pounds per megawatt-hour			

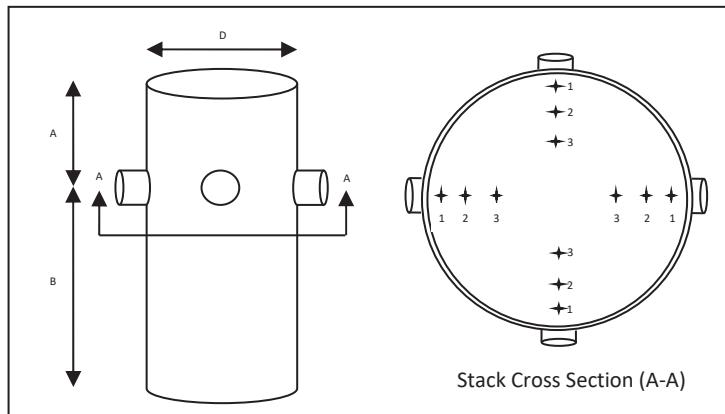
## **Testing Methods**

EMCo used the following EPA Reference Methods for the testing program. No deviations from the Reference Methods were noted.

Parameter	EPA Reference Methods	Test Runs/Duration	Target Sample Volume
PM (lb/mmBtu)	1, 2, 3B, 4, 5*, 19	3 @ 2 hr	2 dscm (70.63 dscf)**
*In accordance with Table 5 of NESHAP Subpart UUUUU, the front-half temperature was set at 320° ± 25°F.			
**Sample volume from Table 2 of NESHAP Subpart UUUUU, doubled in accordance with §63.10005.			

## **Testing Location**

The Huntington Unit 2 exhaust sampling location consists of a vertical, circular stack with four orthogonal sampling ports located at least six diameters downstream and two diameters upstream of the nearest flow disturbances. PM testing was performed across a grid of 12 points determined using EPA Method 1. See the schematic below.



Huntington Test Diagram	
Unit #	2
Diameter (D)	322.7"
Upstream Distance (A)	>220'
Downstream Distance (B)	>266'
<b>Sample Point Distances from Stack Wall</b>	
Traverse Point 1	14.1"
Traverse Point 2	47.3"
Traverse Point 3	95.5"

## **Test Results**

The results of the testing program are given in the tables below. Detailed test results are located in Appendix A, along with sample calculations for all computed values.

PacificCorp Huntington Unit 2 PM Compliance Test Results Summary (2/8/2017)						
Parameter	Run #1	Run #2	Run #3	Average	QA Specification	Emission Limit***
Start Time	7:10	10:11	13:14	—	—	—
Stop Time	9:28	12:33	15:29	—	—	—
Sample Gas Volume (dscf)	76.02	77.48	77.24	76.91	>70.63*	—
Isokinetic Variation (%)	99.6	99.7	100.2	99.8	100 ± 10%	—
Filterable PM (lb/mmBtu)	0.007	0.006	0.006	0.006	—	0.030
Boiler Load (MW)	475	475	475	475	>459**	—
Filterable PM (lb/MW-hr)	0.08	0.06	0.06	0.07	—	0.30

\* Sample volume from Table 2 of NESHAP Subpart UUUUUU, doubled in accordance with §63.10005.  
\*\*90% of design capacity, in accordance with §63.10007(a)(2).  
\*\*\*As shown, average PM emissions were less than 50% of the applicable emission limit, qualifying the unit for Low Emitting EGU (LEE) status.

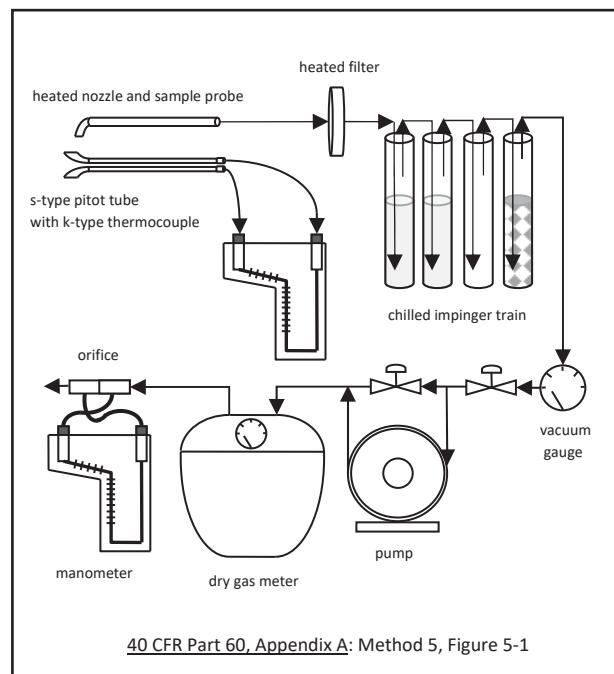
## **Testing Equipment**

All testing equipment was housed in a climate-controlled mobile analytical laboratory designed and built by EMCo. All required quality assurance tests were performed as required by the applicable Reference Methods. Detailed equipment descriptions are given in the table below.

Parameter	Equipment	EPA Reference Method(s)
Particulate Matter (PM)	Heated probe with glass nozzle and stainless steel probe liner Quartz fiber filter S-type pitot tube K-type thermocouple Inclined-vertical manometer Dry gas meter Digital scale Analytical balance	1, 2, 3B, 4, 5, 19

## **Test Details**

Particulate matter testing was performed using EPA Methods 1, 2, 3B, 4 and 5. Each test run was 120 minutes in duration. Sampling was performed along a grid of points determined using EPA Method 1. Exhaust gas flow measurements were taken using an S-type pitot tube, K-type thermocouple and inclined-vertical manometer in accordance with EPA Method 2. A sample of exhaust gas was withdrawn from the stack at an isokinetic flow rate through a heated stainless steel nozzle and probe, through a heated quartz-fiber filter, through four chilled glass impingers containing known masses of water or silica gel, and through a dry gas meter. (See Figure 5-1 at right.) The default dry molecular weight for combustion sources (30 lbs/lb-mole) listed in EPA Method 3 was combined with pressure and temperature measurements to calculate stack gas velocity in accordance with EPA Method 2. Stack gas moisture concentrations were determined gravimetrically in accordance with EPA Method 4. Following each sampling period, the filter and rinses of the nozzle and probe were recovered and returned to EMCo's laboratory for gravimetric analysis. Following analysis, the particulate mass captured during each test run was combined with concurrent flow and moisture data to calculate particulate matter emissions in units of pounds per hour (lb/hr). The particulate mass captured during each test run was combined with concurrent CO<sub>2</sub> concentration data from the plant CEMS<sup>1</sup> and the appropriate fuel F-factor from EPA Method 19 (1,800 scf/mmBtu) to calculate PM emissions in units of pounds per million British thermal units (lb/mmBtu) for comparison to the applicable emission limit.



40 CFR Part 60, Appendix A: Method 5, Figure 5-1

<sup>1</sup> EPA Method 3B §6.0 states "As an alternative to the sampling apparatus and systems described herein, other sampling systems may be used, provided such systems are ... capable of yielding acceptable results." As NESHAP UUUUUU requires certified Part 75 CEMS CO<sub>2</sub> data to calculate SO<sub>2</sub> and mercury emissions in units of lb/mmBtu, CEMS CO<sub>2</sub> data are considered acceptable for PM emission calculations as well.

## **Appended Information**

Supporting data for this testing program are included as follows.

### **Appendix A: Test Summary**

- Data Reduction Spreadsheet
- Sample Calculations

### **Appendix B: Field Data**

- Field Datasheets

### **Appendix C: Laboratory Data**

- Gravimetric Analysis

### **Appendix D: CEMS Data**

- Test Run CEMS Printouts

### **Appendix E: Calibration Information**

- Dry Gas Meter Pre-Test and Post-Test Calibrations
- Critical Orifice Calibration Certificate
- AETB Certification



**Project PC17-0001**

**Appendix A: Test Summary**

Data Reduction Spreadsheets

Sample Calculations

Θ	Run #	1	2	3
	Start Time	7:10	10:11	13:14
	Stop Time	9:28	12:33	15:29
	Sample Time (min.)	120	120	120
<b>EPA Method 2 Data</b>		1	2	3
<b>Inputs</b>				Average
D <sub>s</sub>	Stack Diameter (inches)	322.7	322.7	322.7
P <sub>bar</sub>	Barometric Pressure ("Hg)	23.61	23.61	23.6
P <sub>g</sub>	Stack Static Pressure ("H <sub>2</sub> O)	-3.2	-3.2	-3.2
C <sub>p</sub>	Pitot Tube Coefficient (unitless)	0.84	0.84	0.84
VΔp <sub>avg</sub>	Avg. Velocity Head of Stack Gas v("H <sub>2</sub> O)	0.8476	0.8631	0.8596
T <sub>s</sub>	Stack Gas Temperature (°F)	112	112	112
<b>Calculations</b>				
A	Stack Area (ft <sup>2</sup> )	567.970	567.970	567.970
P <sub>g</sub>	Stack Static Pressure ("Hg)	-0.24	-0.24	-0.24
M <sub>d</sub>	Stack Gas Molecular Weight, dry basis (lb/lb-mole)	30.00	30.00	30.00
M <sub>s</sub>	Stack Gas Molecular Weight, wet basis (lb/lb-mole)	28.59	28.59	28.57
P <sub>s</sub>	Absolute Stack Pressure ("Hg)	23.37	23.37	23.37
T <sub>s(abs)</sub>	Absolute Stack Gas Temperature (°R )	572	572	573
V <sub>s</sub>	Stack Gas Velocity (ft/sec)	56.3	57.3	57.2
Q	Stack Gas Dry Volumetric Flow Rate (dscf/hr)	73,265,528	74,605,329	74,003,597
Q	Stack Gas Dry Volumetric Flow Rate (dscf/min)	1,221,092	1,243,422	1,233,393
<b>CEMS Diluent Data</b>		1	2	3
CO <sub>2</sub> (%vw)		11.0	11.1	11.0
CO <sub>2</sub> (%vd)		12.5	12.6	12.5
<b>EPA Method 4 Data</b>		1	2	3
<b>Inputs</b>				Average
V <sub>lc</sub>	Volume of Water Condensed (mL)	229.2	228.9	239.1
V <sub>m</sub>	Volume of Stack Gas Collected (dcf)	96.538	98.961	99.209
Y	Meter Calibration Factor (unitless)	0.9868	0.9868	0.9868
ΔH	Pressure Differential Across Orifice ("H <sub>2</sub> O)	1.9	1.9	1.9
T <sub>m</sub>	Temperature at Gas Meter (°F)	65	68	71
<b>Calculations</b>				
P <sub>m</sub>	Absolute Pressure at Gas Meter ("Hg)	23.75	23.75	23.75
T <sub>m</sub>	Absolute Temperature at Gas Meter (°R)	525	528	531
V <sub>wc(std)</sub>	Volume of Water Condensed (scf)	10.79	10.77	11.25
V <sub>m(std)</sub>	Sample Gas Volume (dscf)	76.02	77.48	77.24
B <sub>ws act</sub>	Observed Stack Gas Moisture Content (%/100)	0.124	0.122	0.127
B <sub>ws sat</sub>	Saturated Moisture Content (%/100)	0.118	0.118	0.121
B <sub>ws</sub>	Moisture Content Used (%/100)	0.118	0.118	0.121
<b>EPA Method 5 Data</b>		1	2	3
<b>Inputs</b>				Average
D <sub>n</sub>	Nozzle diameter (")	0.233	0.233	0.233
C1	Mass of PM collected on filter (mg)	8.1	6.3	7.2
C2	Mass of PM collected in rinses (mg)	8.7	7.8	7.7
<b>Emission Calculations</b>				
F <sub>c</sub>	Fuel F-Factor (scf/mmbtu)	1800	1800	1800
A <sub>n</sub>	Cross-sectional area of nozzle (ft <sup>2</sup> )	2.96E-04	2.96E-04	2.96E-04
I	Isokinetic variation (%)	99.6	99.7	100.2
m <sub>n</sub>	Total Filterable PM mass less blank (mg)	16.8	14.1	13.7
C <sub>s</sub>	Filterable Particulate concentration (gr/dscf)	0.003	0.003	0.003
C <sub>s</sub>	Filterable Particulate concentration (lb/dscf)	4.87E-07	4.01E-07	3.91E-07
E <sub>lb/hr</sub>	Filterable Particulate mass emission rate (lb/hr)	36	30	29
	Boiler Load (MW)	475	475	475
	Filterable Particulate mass emission rate (lb/MW-hr)	0.08	0.06	0.06
F <sub>c</sub>	Filterable Particulate mass emission rate (lb/mmBtu)	0.007	0.006	0.006
8760 hrs/yr	Filterable Particulate mass emission rate (tons/year)	156	131	127

EPA Method 5: Determination of Particulate Matter Emissions (40 CFR Part 60, Appendix A-1)

Variables

Variable	Value	Definition	Unit of Measurement
D <sub>s</sub>	322.7	Stack Diameter	inches
A	567.97	Cross-Sectional Area of the Stack	ft <sup>2</sup>
P <sub>g</sub>	-3.20	Stack Static Pressure	in. H <sub>2</sub> O
P <sub>g</sub>	-0.24	Stack Static Pressure	in. Hg
%CO <sub>2</sub>	12.5	Concentration of Carbon Dioxide	Dry Volume Percent (%vd)
M <sub>d</sub>	30.00	Dry Molecular Weight of the Stack Gas (default)	lb/lb-mole
P <sub>bar</sub>	23.61	Barometric Pressure	in. Hg
ΔH	1.90	Pressure Differential across Orifice	in. H <sub>2</sub> O
P <sub>m</sub>	23.75	Absolute Pressure at Gas Meter	in.Hg
t <sub>m</sub>	65	Temperature at Gas Meter	°F
T <sub>m</sub>	525	Absolute Temperature at Gas Meter	°R
K1	0.04706	Conversion Factor	ft <sup>3</sup> /mL
V <sub>lc</sub>	229.2	Volume of Water Condensed	g
V <sub>wc(std)</sub>	10.79	Volume of Water Condensed	scf
K <sub>4</sub>	17.64	Constant	°R/in.Hg
Y	0.9868	Meter Calibration Factor	Unitless
V <sub>m</sub>	96.538	Volume of Stack Gas Collected	dcf
V <sub>m(std)</sub>	76.019	Sample Gas Volume	dscf
B <sub>ws</sub>	0.118	Stack Gas Moisture Content	%/100
M <sub>s</sub>	28.59	Actual Molecular Weight of the Stack Gas	lb/lb-mole
P <sub>s</sub>	23.37	Absolute Stack Pressure	in. Hg
T <sub>s</sub>	112	Average Stack Temperature	°F
T <sub>s(abs)</sub>	572	Average Absolute Stack Temperature	°R
K <sub>p</sub>	85.49	Conversion Factor	(ft/sec) x V(((lb/lb-mole)(in.Hg))/((°R)(in.H <sub>2</sub> O)))
C <sub>p</sub>	0.84	Pitot Coefficient	Dimensionless
AvgVΔp	0.8476	Average Square Root of Velocity Head Readings	in. H <sub>2</sub> O
V <sub>s</sub>	56.31	Average Stack Gas Velocity	ft/sec
T <sub>std</sub>	528	Standard Absolute Temperature	°R
P <sub>std</sub>	29.92	Standard Absolute Pressure	in. Hg
Q	73,265,528	Dry Volumetric Flow Rate Corrected to Standard Conditions	dscf/hr
D <sub>n</sub>	0.233	Nozzle Diameter	inches
A <sub>n</sub>	2.96E-04	Cross-Sectional Area of the Nozzle	ft <sup>2</sup>
m <sub>n</sub>	16.80	Total PM Mass	mg
C <sub>s</sub>	4.87E-07	Particulate Concentration	lb/dscf
E <sub>lb/hr</sub>	35.7	PM Mass Emission Rate	pounds per hour
F <sub>c</sub>	1800	F-Factor from EPA Method 19	scf/mmBtu
E <sub>lb/mmBtu</sub>	0.007	PM Mass Emission Rate	pounds per million Btu
E <sub>tons/yr</sub>	156.3	PM Mass Emission Rate	tons per year
K <sub>5</sub>	0.0945	Constant	(in.Hg · min) / (°R · sec)
Θ	120	Sample Time	minutes
I	99.6 %	Isokinetic variation	percent

**PC17-01.3**  
**PacifiCorp**  
**Huntington Unit 2**  
**Run #1 Sample Calculations**

**EPA Method 5: Determination of Particulate Matter Emissions (40 CFR Part 60, Appendix A-1)**

$$A = \pi(D_s/24)^2$$

$$\pi(322.7/24)^2$$

$$= 567.97 \text{ ft}^2$$

$$P_g = P_{bar}/13.6$$

$$= -3.2/13.6$$

$$= -0.24 \text{ in. Hg}$$

$$M_d = 30.00 \text{ lb/lb-mole}$$

$$P_m = P_{bar} + (\Delta H/13.6)$$

$$= 23.61 + (1.9/13.6)$$

$$= 23.75 \text{ in. Hg}$$

$$T_m = 460 + t_m$$

$$= 460 + 65$$

$$= 525 \text{ R}$$

$$V_{wc(std)} = K_1 \times V_{lc}$$

$$= 0.04706 \times 229.2$$

$$= 10.79 \text{ scf} \quad (Eq. 4-1)$$

$$V_{m(std)} = \frac{K_4 \times Y \times V_m \times P_m}{T_m}$$

$$= \frac{17.64 \times 0.9868 \times 96.538 \times 23.75}{525}$$

$$= 76.02 \text{ dscf} \quad (Eq. 4-3)$$

$$B_{ws} = \frac{V_{wc(std)}}{V_{wc(std)} + V_{m(std)}}$$

$$= \frac{10.79}{10.79 + 76.02}$$

= 0.124 (%/100) *(Eq. 4-4)* [Observed value above saturation; calculated saturation value used for subsequent calculations.]

$$M_s = M_d \times (1 - B_{ws}) + (18.0 \times B_{ws})$$

$$= 30.00 \times (1 - 0.118) + (18.0 \times 0.118)$$

$$= 28.59 \text{ lb/lb-mole} \quad (Eq. 2-6)$$

$$P_s = P_{bar} + P_g$$

$$= 23.61 + (-0.24)$$

$$= 23.37 \text{ in. Hg}$$

$$T_{s(abs)} = 460 + T_s$$

$$= 460 + 112$$

$$= 572 \text{ R}$$

**PC17-01.3**  
**PacifiCorp**  
**Huntington Unit 2**  
**Run #1 Sample Calculations**

EPA Method 5: Determination of Particulate Matter Emissions (40 CFR Part 60, Appendix A-1)

$$V_s = K_p \times C_p \times Avgv/\Delta p \times \sqrt{\frac{T_{s(abs)}}{(P_s \times M_s)}}$$

$$= 85.49 \times 0.84 \times 0.8476 \times \sqrt{\frac{572}{(23.37 \times 28.59)}}$$

$$= 56.3 \text{ ft/sec}$$

(Eq. 2-7)

$$Q = 3600 \times (1 - B_{ws}) \times (V_s) \times (A) \times \frac{(T_{std} \times P_s)}{(T_{s(abs)} \times P_{std})}$$

$$= 3600 \times (1 - 0.118) \times (56.31) \times (567.97) \times \frac{(528 \times 23.37)}{(572 \times 29.92)}$$

$$= 73,265,528 \text{ dscf/hr}$$

(Eq. 2-8)

$$A_n = \pi(D_n/24)^2$$

$$\pi(0.233/24)^2$$

$$= 2.96E-04 \text{ ft}^2$$

$$C_s = \frac{m_n}{(mg/g) (g/lb) (V_{m(std)})}$$

$$= \frac{16.8}{(1000) (453.592) (76.019)}$$

$$= 4.87E-07 \text{ lb/dscf}$$

$$E_{lb/hr} = C_s \times Q$$

$$= 4.87E-07 \times 73265528$$

$$= 35.7 \text{ lb/hr}$$

$$E_{lb/mmBtu} = \frac{C_s \times F_c \times 100}{(CO_2\%vd)}$$

$$= \frac{4.87E-07 \times 1800 \times 100}{(12.5)}$$

$$= 0.007 \text{ lb/mmBtu}$$

$$E_{tons/yr} = \frac{E_{lb/hr} \times (\text{Hrs/yr})}{(\text{lbs/ton})}$$

$$= \frac{35.70 \times 8,760}{2000}$$

$$= 156.3 \text{ tons/year}$$

$$I = \frac{K5 \times T_{s(abs)} \times V_{m(std)} \times 100}{P_{s(abs)} \times V_s \times A_n \times \Theta \times (1 - B_{ws})}$$

$$= \frac{0.0945 \times 572 \times 76.019 \times 100}{23.37 \times 56.31 \times 3.0E-04 \times 120 \times (1 - 0.118)}$$

$$= 99.6 \%$$

(Eq. 5-7)





**Project PC17-0001**  
**Appendix B: Field Data**  
Field Datasheets

# Emissions Measurement Company: Method 5/202 Data Sheet

EMCo Job #: 045-AQS-127698		Operator(s): Ch
Client: Pacificorp	Barometric pressure ("Hg):	25.38 23.61
Source: U2 HTG	Static pressure ("H <sub>2</sub> O):	-3.2
Date: 2-8-17	Leak Check ("H <sub>2</sub> O @ Vac):	0.00 @ 10"
Run # 1	Leak Check ("H <sub>2</sub> O @ Vac):	0.00 @ 12"
Meterbox ID: MS-3	Pitot ID / Coeff:	/ .84
Meterbox Y = -9868 ΔH@= 1.8	Pitot Leak Check:	
O <sub>2</sub> %: 16.5	Nozzle Diameter:	-238 0.233
CO <sub>2</sub> %: 12	K Factor:	2.55 2.58
Start Time 710	Stop Time 928	

Impinger Weights (x.x g)	Initial	Final
Impinger 1		
Impinger 2		
Impinger 3		
Impinger 4 (SG)		
Total	726.8	956.0
Total	229.2	

Traverse Point	Sample Time	Stack Temp (°F)	Probe Temp (°F)	Filter Temp (°F)	Velocity Δp ("H <sub>2</sub> O)	Orifice Pressure ΔH ("H <sub>2</sub> O)	Vacuum ("Hg)	Sample Volume (ft <sup>3</sup> )	DGM Temp (°F) Inlet	CPM Filter Temp (°F) Outlet	Imp. Outlet Temp (°F)
								031.978			
1 1	10	112	319	321	.69	1.5	4	039.0	61	55	N/A 43
2	20	110	320	319	.69	1.8	5	046.8	66	57	1 48
3	30	110	319	321	.76	2.0	6	055.3	69	59	50
2 1	40	112	319	319	.62	1.6	5	063.0	69	60	45
2	50	112	321	319	.80	2.1	5	071.4	70	61	41
3	60	112	320	318	.78	2.0	5	080.0	70	62	42
3 1	70	110	320	321	.60	1.5	4	087.1	71	63	46
2	80	110	318	322	.77	2.0	5	095.8	72	63	50
3	90	112	317	318	.79	2.0	5	103.9	72	64	55
4 1	100	112	319	320	.63	1.6	5	111.5	71	64	53
2	110	113	309	320	.80	2.1	5	119.9	72	64	51
3	120	113	310	319	.81	2.1	5	128.516	72	64	52
12	120	(112)	309	318	(.8476)	(1.9)	6	096.538	(6.5)		55
Total	Total	Average	Minimum	Minimum	Avg VAp	Average	Max.	Total	Average	Average	Maximum

# Emissions Measurement Company: Method 5/202 Data Sheet

EMCo Job #:	045-AQS-127698	Operator(s):	CW/AB
Client:	Pacificorp	Barometric pressure ("Hg):	23.6
Source:	HTG U2	Static pressure ("H <sub>2</sub> O):	-3.2
Date:	2-8-17	Leak Check ("H <sub>2</sub> O @ Vac):	0.00 @ 12"
Run #	2	Leak Check ("H <sub>2</sub> O @ Vac):	0.00 @ 13"
Meterbox ID:	MS-3	Pitot ID / Coeff:	/ .84
Meterbox Y =	9.8168ΔH = 1.8	Pitot Leak Check:	✓
O <sub>2</sub> %:	6.5	Nozzle Diameter:	.238
CO <sub>2</sub> %:	12.0	K Factor:	2.6
Start Time	1011	Stop Time	1233

Impinger Weights (x.x g)	Initial	Final
Impinger 1		
Impinger 2		
Impinger 3		
Impinger 4 (SG)		
Total	710.9	939.8
Total		228.9

Traverse Point	Sample Time	Stack Temp (°F)	Probe Temp (°F)	Filter Temp (°F)	Velocity Δp ("H <sub>2</sub> O)	Orifice Pressure ΔH ("H <sub>2</sub> O)	Vacuum ("Hg)	Sample Volume (ft <sup>3</sup> )	DGM Temp (°F) Inlet	CPM Filter Temp (°F) Outlet	Imp. Outlet Temp (°F)
(1) 1	10	113	308	322	.62	1.6	4	128.677			
2	20	111	305	319	.80	2.1	5	136.4	68	63	NA 36
3	30	110	306	319	.80	2.1	5	144.8	72	63	40
											45
(2) 1	40	114	307	320	.65	1.7	4	153.4	73	63	51
2	50	113	305	321	.79	2.1	5	161.2	71	64	46
3	60	113	306	320	.82	2.1	5	169.7	72	64	44
(3) 1	70	111	305	324	.61	1.6	4	178.5	73	65	39
2	80	111	303	320	.82	2.1	5	186.1	70	65	40
3	90	111	305	318	.82	2.1	5	194.7	71	65	41
(4) 1	100	113	301	324	0.63	1.5	4	203.2	72	65	39
2	110	114	311	318	.88	2.1	5	210.5	66	65	39
3	120	113	312	319	.81	2.1	5	219.1	71	65	42
12	120	112	301	318	86.31	1.9	5	227.638	72	68	51
Total	Total	Average	Minimum	Minimum	Avg Δp	Average	Max.	Total	Average	Average	Maximum

# Emissions Measurement Company: Method 5/202 Data Sheet

EMCo Job #:	045 ABS - 127698	Operator(s):	CW
Client:	Pacificorp	Barometric pressure ("Hg):	23.6
Source:	HTG U2	Static pressure ("H <sub>2</sub> O):	-3.2
Date:	2-8-17	Leak Check ("H <sub>2</sub> O @ Vac):	0.00 @ 12"
Run #	3	Leak Check ("H <sub>2</sub> O @ Vac):	0.00 @ 13"
Meterbox ID:	MS-3	Pitot ID / Coeff:	.84
Meterbox Y = .9868	ΔH@= 1.8	Pitot Leak Check:	✓
O <sub>2</sub> %:	6.5	Nozzle Diameter:	.238 0.233
CO <sub>2</sub> %:	12.0	K Factor:	2.61
Start Time	1314	Stop Time	1529

Impinger Weights (x.x g)	Initial	Final
Impinger 1		
Impinger 2		
Impinger 3		
Impinger 4 (SG)		
Total	729.9	969.0
Total	1239.11	

Traverse Point	Sample Time	Stack Temp (°F)	Probe Temp (°F)	Filter Temp (°F)	Velocity Δp ("H <sub>2</sub> O)	Orifice Pressure ΔH ("H <sub>2</sub> O)	Vacuum ("Hg)	Sample Volume (ft <sup>3</sup> )	DGM Temp (°F) Inlet	CPM Filter Temp (°F) Outlet	Imp. Outlet Temp (°F)
(1) 1	10	112	304	320	.61	1.6	5	235.4	67	65	N/A
2	20	111	305	321	.79	2.1	6	243.0	74	65	46
3	30	113	304	321	.82	2.1	6	252.5	75	66	48
(2) 1	40	114	302	319	.58	1.5	5	259.9	74	67	50
2	50	114	301	320	.80	2.1	5	268.5	74	67	53
3	60	114	302	322	.82	2.1	5	277.0	75	67	56
(3) 1	70	111	301	320	.60	1.6	5	284.9	74	67	57
2	80	111	302	319	.79	2.1	5	253.4	73	67	60
3	90	113	307	319	.84	2.2	6	302.1	75	68	61
(4) 1	100	113	302	321	.62	1.6	5	309.7	74	68	60
2	110	113	304	321	.81	2.1	6	318.2	76	69	58
3	120	113	302	318	.83	2.2	6	326.998	76	69	54
12	120	(113)	301	318	.8596	(1.9)	6	99.209	(71)	N/A	61
Total	Total	Average	Minimum	Minimum	Avg Δp	Average	Max.	Total	Average	Average	Maximum



**Project PC17-0001**  
**Appendix C: Lab Data**  
Gravimetric Analysis

Project Code:	PC17-1.3
Date Finalized:	2/16/2017
Analyst:	Parks

Laboratory Results Summary	
Sample ID	Filterable Particulate Matter (mg)
Huntington Unit 2, Run #1	16.8
Huntington Unit 2, Run #2	14.1
Huntington Unit 2, Run #3	13.7

No blank corrections were performed.

**Analytical Narrative**

Quartz fiber filters were dessicated and tared to a constant weight in the EMCo laboratory prior to sampling. Following testing, the filters were dessicated for at least 24 hours, then weighed to a constant weight ( $\pm 0.5$  mg). The acetone rinses were measured to the nearest milliliter, transferred to tared aluminum weighing dishes, taken to dryness under a fume hood, then weighed to a constant weight ( $\pm 0.5$  mg). Each result above represents total filterable particulate matter for each test run (acetone rinse + filter catch), with no blank correction performed unless otherwise indicated.

**Instrumentation**

All measurements were taken using a Torbal Model AGCN200 Analytical Balance under laboratory conditions. The instrument is auto-calibrated and challenged with three NIST-traceable reference weights daily.

**Detection Limit / Sensitivity**

All measurements are recorded to 0.0001g (0.1mg).

**Notes**

No deviations from the analytical procedure from EPA Method 5 were noted. All samples were received in good condition. After analysis, all samples are archived for a period of one year.

**Attachments**

Gravimetric Analysis Logs

Sample Chain of Custody



## EPA Method 5 Gravimetric Analysis Log

Project Code:	PC17-1.3
Unit ID:	Huntington Unit 2

### Front-Half Particulate Matter Filter Catch

Filter #	Run #1		Run #2		Run #3	
	Date	Weight (g)	Date	Weight (g)	Date	Weight (g)
Final Weight (g)	2/14/17	0.3893	2/14/17	0.3929	2/14/17	0.3934
Tare Weight (g)	1/19/17	0.3812	9/1/16	0.3866	9/1/16	0.3862
Filter Catch (g)		0.0081		0.0063		0.0072

### Front-Half Particulate Matter Acetone Rinse Catch

Dish #	Run #1		Run #2		Run #3		Blank	
	Date	Weight (g)						
Final Weight (g)	2/13/17	6.5881	2/13/17	6.5724	2/13/17	6.5644	2/13/17	6.6080
Tare Weight (g)	1/11/17	6.5794	1/11/17	6.5646	1/11/17	6.5579	1/11/17	6.6084
Total Rinse Catch (g)		0.0087		0.0078		0.0065		-0.0004

### Total Particulate Catch

	Run #1	Run #2	Run #3
Filter Catch (g)	0.0081	0.0063	0.0072
+ Rinse Catch (g)	0.0087	0.0078	0.0065
- Acetone Blank (g)	0.0000	0.0000	0.0000
Total PM (g)	0.0168	0.0141	0.0137

## Laboratory Chain of Custody Record

Project Code:							
Client:	Parifcorp						
Facility:	Huntington						
Unit:	1 + 2						
Sample Date(s):	2-7(U1) 2-8(U2)						
Project Manager:	Bruning						
Sample ID / Run #	Filter ID	Front ½ Acetone		Back ½ Hexane		Back ½ Water	
		Tin ID	Volume (mL)	Tin ID	Volume (mL)	Baggie ID	Volume (mL)
U1 R1	1261	1837		N/A		N/A	
U1 R2	1262	1829		1		1	
U1 R3	1263	1830		1		1	
U2 R1	1278	1846		1		1	
U2 R2	1137	1848		1		1	
U2 R3	1138	1847		1		1	
Blank		1836					
Relinquished by:	<u>HB</u>			Date: <u>2/9</u>			
Received by:	<u>MWP</u>			Date <u>2/9</u>			



**Project PC17-0001**  
**Appendix D: CEMS Data**  
CEMS Printouts for Test Runs

# Average Data

Plant: HUNTINGTON PLANT

Interval: 1 Minute

Type: Block

Report Period: 02/08/2017 07:10 Through 02/08/2017 09:28

Time Online Criteria: 1 minute(s)

Source Parameter (Unit)	UNIT2				
	BARPRESS (INHG)	CO2 (PCT)	OPACITY (PCT)	STKTEMP (DEGF)	UNITLOAD (MW)
02/08/17 07:10	23.672	11.2	3.0	112.22	478
02/08/17 07:11	23.671	11.0	3.1	112.58	479
02/08/17 07:12	23.675	11.0	3.1	112.77	479
02/08/17 07:13	23.677	11.0	3.1	112.61	478
02/08/17 07:14	23.678	11.1	3.1	112.68	477
02/08/17 07:15	23.681	11.0	3.2	112.83	477
02/08/17 07:16	23.681	10.9	3.1	112.83	476
02/08/17 07:17	23.680	11.0	3.0	112.83	476
02/08/17 07:18	23.677	11.0	3.0	112.78	475
02/08/17 07:19	23.680	10.9	3.0	112.80	474
02/08/17 07:20	23.683	10.9	3.0	112.73	474
02/08/17 07:21	23.684	10.9	3.0	112.66	474
02/08/17 07:22	23.683	10.9	3.1	112.67	473
02/08/17 07:23	23.684	10.9	3.0	112.54	473
02/08/17 07:24	23.686	11.0	3.0	112.64	474
02/08/17 07:25	23.688	11.0	3.0	112.68	475
02/08/17 07:26	23.691	11.0	3.0	112.54	476
02/08/17 07:27	23.690	11.1	2.9	112.43	477
02/08/17 07:28	23.691	11.1	2.9	112.35	478
02/08/17 07:29	23.693	11.1	2.9	112.42	479
02/08/17 07:30	23.693	11.0	3.0	112.47	479
02/08/17 07:31	23.690	11.0	3.0	112.55	478
02/08/17 07:32	23.688	11.0	3.0	112.64	477
02/08/17 07:33	23.689	10.9	2.9	112.92	476
02/08/17 07:34	23.690	10.9	2.8	113.27	475
02/08/17 07:35	23.690	10.9	2.8	111.34	475
02/08/17 07:36	23.689	11.0	2.8	109.83	474
02/08/17 07:37	23.689	11.0	2.8	108.56	474
02/08/17 07:38	23.690	11.0	2.8	107.72	474
02/08/17 07:39	23.694	11.1	2.9	107.76	475
02/08/17 07:40	23.695	11.1	3.0	107.89	475
02/08/17 07:41	23.692	11.0	3.0	107.66	475
02/08/17 07:42	23.691	11.0	2.9	107.63	476
02/08/17 07:43	23.693	11.0	2.9	107.97	477
02/08/17 07:44	23.693	11.0	2.9	106.94	476
02/08/17 07:45	23.695	11.1	3.0	105.79	476
02/08/17 07:46	23.697	11.1	2.9	105.98	476
02/08/17 07:47	23.695	11.0	2.9	106.25	475

F = Unit Offline

E = Exceedance

I = Invalid

M = Maintenance

C = Calibration

S = Substituted

T = Out Of Control

# Average Data

Plant: HUNTINGTON PLANT

Interval: 1 Minute

Type: Block

Report Period: 02/08/2017 07:10 Through 02/08/2017 09:28

Time Online Criteria: 1 minute(s)

02/08/17	07:48	23.692	11.0	2.9	106.39	474
02/08/17	07:49	23.693	11.0	2.9	107.04	474
02/08/17	07:50	23.694	11.0	2.9	110.84	475
02/08/17	07:51	23.694	11.0	2.8	112.18	476
02/08/17	07:52	23.695	11.0	2.8	112.20	477
02/08/17	07:53	23.698	11.1	2.8	112.16	477
02/08/17	07:54	23.698	11.1	2.8	112.11	479
02/08/17	07:55	23.697	11.0	2.8	112.17	480
02/08/17	07:56	23.696	11.0	2.7	112.20	481
02/08/17	07:57	23.698	11.1	2.7	112.40	479
02/08/17	07:58	23.699	11.0	2.7	112.73	476
02/08/17	07:59	23.698	10.8	2.8	113.03	473
02/08/17	08:00	23.699	10.7 I	2.7	113.11	471
02/08/17	08:01	23.700	4.7 I	2.7	113.45	471
02/08/17	08:02	23.702	9.6 I	2.7	113.59	471
02/08/17	08:03	23.703	10.9 I	2.6	113.23	471
02/08/17	08:04	23.704	11.0 I	2.6	112.94	472
02/08/17	08:05	23.705	10.9 I	2.6	112.83	473
02/08/17	08:06	23.705	10.9	2.5	112.78	473
02/08/17	08:07	23.707	10.9	2.5	112.73	474
02/08/17	08:08	23.707	11.0	2.5	112.70	475
02/08/17	08:09	23.707	11.0	2.5	112.80	475
02/08/17	08:10	23.707	10.9	2.5	112.88	475
02/08/17	08:11	23.708	11.0	2.5	112.86	474
02/08/17	08:12	23.709	11.0	2.5	112.75	474
02/08/17	08:13	23.708	10.9	2.5	112.77	473
02/08/17	08:14	23.708	10.9	2.5	112.89	472
02/08/17	08:15	23.709	10.9	2.5	112.92	472
02/08/17	08:16	23.711	10.9	2.6	112.82	472
02/08/17	08:17	23.712	10.9	2.5	112.65	472
02/08/17	08:18	23.713	11.0	2.5	112.54	472
02/08/17	08:19	23.713	10.9	2.5	112.73	472
02/08/17	08:20	23.713	10.9	2.6	112.87	472
02/08/17	08:21	23.715	11.0	2.6	112.91	473
02/08/17	08:22	23.715	11.0	2.6	112.68	473
02/08/17	08:23	23.715	11.1	2.6	112.69	474
02/08/17	08:24	23.715	11.0	2.5	112.83	475
02/08/17	08:25	23.714	11.0	2.5	112.67	475
02/08/17	08:26	23.715	11.1	2.5	112.56	475
02/08/17	08:27	23.716	11.0	2.5	112.89	475
02/08/17	08:28	23.718	11.0	2.5	113.03	475

F = Unit Offline

E = Exceedance

I = Invalid

M = Maintenance

C = Calibration

S = Substituted

T = Out Of Control

# Average Data

Plant: HUNTINGTON PLANT

Interval: 1 Minute

Type: Block

Report Period: 02/08/2017 07:10 Through 02/08/2017 09:28

Time Online Criteria: 1 minute(s)

02/08/17	08:29	23.719	11.0	2.5	112.97	475
02/08/17	08:30	23.720	11.0	2.5	112.94	475
02/08/17	08:31	23.721	11.0	2.5	108.96	476
02/08/17	08:32	23.721	11.1	2.5	108.18	476
02/08/17	08:33	23.723	11.2	2.5	108.05	477
02/08/17	08:34	23.724	11.0	2.6	107.94	477
02/08/17	08:35	23.724	11.1	2.6	108.01	477
02/08/17	08:36	23.726	11.2	2.6	107.76	476
02/08/17	08:37	23.728	11.1	2.6	107.31	477
02/08/17	08:38	23.729	11.1	2.5	107.24	477
02/08/17	08:39	23.730	11.1	2.5	107.55	477
02/08/17	08:40	23.730	11.0	2.6	107.60	476
02/08/17	08:41	23.730	11.1	2.6	106.73	475
02/08/17	08:42	23.731	11.0	2.6	105.97	475
02/08/17	08:43	23.730	11.1	2.6	105.67	475
02/08/17	08:44	23.730	11.1	2.6	105.56	474
02/08/17	08:45	23.730	11.1	2.7	105.34	474
02/08/17	08:46	23.731	11.1	2.6	105.54	474
02/08/17	08:47	23.733	11.1	2.7	106.30	474
02/08/17	08:48	23.734	11.1	2.6	106.92	474
02/08/17	08:49	23.736	11.1	2.7	107.56	474
02/08/17	08:50	23.738	11.0	2.7	107.25	474
02/08/17	08:51	23.739	11.1	2.7	106.49	473
02/08/17	08:52	23.740	11.1	2.7	108.34	474
02/08/17	08:53	23.740	11.1	2.8	111.14	474
02/08/17	08:54	23.740	11.0	2.7	112.20	475
02/08/17	08:55	23.740	11.0	2.7	112.46	475
02/08/17	08:56	23.740	11.0	2.7	112.30	475
02/08/17	08:57	23.741	11.0	2.7	112.11	474
02/08/17	08:58	23.741	11.0	2.7	112.15	474
02/08/17	08:59	23.741	11.0	2.7	112.52	474
02/08/17	09:00	23.742	10.9	2.7	112.74	474
02/08/17	09:01	23.743	11.0	2.8	112.56	474
02/08/17	09:02	23.743	11.0	2.7	112.47	474
02/08/17	09:03	23.744	11.0	2.7	112.55	474
02/08/17	09:04	23.745	11.0	2.7	112.61	474
02/08/17	09:05	23.746	11.0	2.7	112.77	474
02/08/17	09:06	23.747	11.0	2.7	112.93	474
02/08/17	09:07	23.748	11.0	2.8	112.89	474
02/08/17	09:08	23.747	11.1	2.8	112.79	474
02/08/17	09:09	23.747	11.1	2.8	113.03	474

F = Unit Offline

E = Exceedance

I = Invalid

M = Maintenance

C = Calibration

S = Substituted

T = Out Of Control

# Average Data

Plant: HUNTINGTON PLANT

Interval: 1 Minute

Type: Block

Report Period: 02/08/2017 07:10 Through 02/08/2017 09:28

Time Online Criteria: 1 minute(s)

02/08/17	09:10	23.747	11.0	2.8	113.30	474
02/08/17	09:11	23.747	11.0	2.8	113.25	474
02/08/17	09:12	23.748	11.1	2.8	112.95	475
02/08/17	09:13	23.749	11.1	2.8	113.14	476
02/08/17	09:14	23.750	11.1	2.8	113.43	477
02/08/17	09:15	23.752	11.1	2.8	113.58	478
02/08/17	09:16	23.753	11.0	2.8	113.58	478
02/08/17	09:17	23.752	11.0	2.8	113.69	478
02/08/17	09:18	23.752	11.0	2.8	113.73	478
02/08/17	09:19	23.752	11.1	2.8	113.64	478
02/08/17	09:20	23.751	11.0	2.8	113.56	478
02/08/17	09:21	23.751	11.1	2.7	113.72	479
02/08/17	09:22	23.750	11.0	2.7	114.11	478
02/08/17	09:23	23.751	11.0	2.7	114.27	478
02/08/17	09:24	23.751	11.0	2.7	114.14	477
02/08/17	09:25	23.752	11.0	2.7	114.13	476
02/08/17	09:26	23.752	11.0	2.6	114.05	476
02/08/17	09:27	23.753	11.0	2.7	113.85	477
02/08/17	09:28	23.752	11.0	2.7	113.86	477

Average	23.715	11.0	2.7	111.37	475
Minimum	23.671	10.8	2.5	105.34	471
Maximum	23.753	11.2	3.2	114.27	481
Summation	3,296.420	1,465.1	381.3	15,480.69	66,056
Included Data Points	139	133	139	139	139
Total number of Data Points	139	139	139	139	139

F = Unit Offline

E = Exceedance

I = Invalid

M = Maintenance

Report Generated: 02/08/17 09:54 AM

C = Calibration

S = Substituted

T = Out Of Control

# Average Data

Plant: HUNTINGTON PLANT

Interval: 1 Minute

Type: Block

Report Period: 02/08/2017 10:11 Through 02/08/2017 12:33

Time Online Criteria: 1 minute(s)

Source Parameter (Unit)	UNIT2				
	BARPRESS (INHG)	CO2 (PCT)	OPACITY (PCT)	STKTEMP (DEGF)	UNITLOAD (MW)
02/08/17 10:11	23.771	11.0	2.7	113.32	473
02/08/17 10:12	23.771	11.0	2.7	113.50	473
02/08/17 10:13	23.770	10.9	2.7	113.54	473
02/08/17 10:14	23.768	11.0	2.7	113.24	473
02/08/17 10:15	23.768	11.0	2.7	113.26	472
02/08/17 10:16	23.770	11.0	2.7	113.48	473
02/08/17 10:17	23.772	11.0	2.7	113.49	473
02/08/17 10:18	23.775	11.1	2.8	113.54	473
02/08/17 10:19	23.776	11.0	2.8	113.51	473
02/08/17 10:20	23.775	11.0	2.8	113.40	473
02/08/17 10:21	23.773	11.0	2.8	113.52	473
02/08/17 10:22	23.771	11.0	2.8	113.60	473
02/08/17 10:23	23.770	11.0	2.8	113.66	473
02/08/17 10:24	23.769	11.0	2.8	113.40	473
02/08/17 10:25	23.768	11.1	2.8	113.16	474
02/08/17 10:26	23.768	11.1	2.7	113.23	474
02/08/17 10:27	23.769	11.0	2.7	113.23	474
02/08/17 10:28	23.772	11.1	2.7	113.30	475
02/08/17 10:29	23.774	11.1	2.7	112.01	475
02/08/17 10:30	23.775	11.1	2.8	110.46	475
02/08/17 10:31	23.775	11.1	2.9	109.94	475
02/08/17 10:32	23.776	11.1	2.9	109.30	476
02/08/17 10:33	23.777	11.2	2.8	108.76	476
02/08/17 10:34	23.776	11.2	2.8	108.53	477
02/08/17 10:35	23.776	11.2	2.8	108.17	477
02/08/17 10:36	23.776	11.2	2.9	108.27	477
02/08/17 10:37	23.777	11.1	2.9	108.40	477
02/08/17 10:38	23.778	11.2	2.9	106.44	477
02/08/17 10:39	23.780	11.3	3.0	107.11	477
02/08/17 10:40	23.780	11.2	3.1	106.42	477
02/08/17 10:41	23.781	11.2	3.1	106.14	476
02/08/17 10:42	23.781	11.2	2.9	106.76	477
02/08/17 10:43	23.780	11.2	2.9	107.67	478
02/08/17 10:44	23.779	11.3	2.9	111.68	479
02/08/17 10:45	23.780	11.3	2.8	112.72	480
02/08/17 10:46	23.780	11.1	2.8	113.06	479
02/08/17 10:47	23.781	11.1	2.9	113.27	478
02/08/17 10:48	23.782	11.1	2.9	113.27	477

F = Unit Offline

E = Exceedance

I = Invalid

M = Maintenance

C = Calibration

S = Substituted

T = Out Of Control

# Average Data

Plant: HUNTINGTON PLANT

Interval: 1 Minute

Type: Block

Report Period: 02/08/2017 10:11 Through 02/08/2017 12:33

Time Online Criteria: 1 minute(s)

02/08/17	10:49	23.784	11.1	3.1	113.35	476
02/08/17	10:50	23.785	11.0	3.0	113.60	475
02/08/17	10:51	23.786	11.0	3.0	113.76	475
02/08/17	10:52	23.786	11.1	2.9	113.72	475
02/08/17	10:53	23.785	11.1	2.8	113.53	476
02/08/17	10:54	23.785	11.1	2.8	113.46	476
02/08/17	10:55	23.785	11.1	2.8	113.54	477
02/08/17	10:56	23.786	11.1	2.9	113.71	477
02/08/17	10:57	23.787	11.1	2.9	113.82	477
02/08/17	10:58	23.788	11.1	2.9	113.79	477
02/08/17	10:59	23.789	11.1	2.8	113.77	477
02/08/17	11:00	23.789	11.0	2.8	113.87	476
02/08/17	11:01	23.789	11.0	2.8	113.78	475
02/08/17	11:02	23.788	11.1	2.8	113.73	474
02/08/17	11:03	23.788	11.0	2.8	114.04	473
02/08/17	11:04	23.788	10.9	2.8	114.21	472
02/08/17	11:05	23.788	11.0	2.8	114.14	471
02/08/17	11:06	23.789	11.0	2.9	114.11	471
02/08/17	11:07	23.789	11.0	2.8	114.03	472
02/08/17	11:08	23.789	11.0	2.9	113.80	472
02/08/17	11:09	23.788	11.1	2.9	113.66	473
02/08/17	11:10	23.788	11.1	2.8	113.74	474
02/08/17	11:11	23.789	11.0	2.8	113.87	474
02/08/17	11:12	23.790	11.1	2.8	113.96	475
02/08/17	11:13	23.791	11.1	2.8	113.95	476
02/08/17	11:14	23.791	11.1	2.8	113.73	476
02/08/17	11:15	23.791	11.2	2.8	113.57	477
02/08/17	11:16	23.792	11.2	2.9	113.75	476
02/08/17	11:17	23.792	11.1	3.2	113.95	476
02/08/17	11:18	23.791	11.1	3.3	113.96	475
02/08/17	11:19	23.790	11.0	3.1	114.29	476
02/08/17	11:20	23.790	11.0	3.0	114.47	478
02/08/17	11:21	23.790	11.1	2.9	114.36	480
02/08/17	11:22	23.790	11.2	2.9	114.48	481
02/08/17	11:23	23.789	11.1	2.8	114.47	480
02/08/17	11:24	23.789	11.1	2.8	114.53	478
02/08/17	11:25	23.789	10.9	2.8	114.97	474
02/08/17	11:26	23.788	10.8	2.8	115.14	472
02/08/17	11:27	23.788	10.9	2.7	115.07	469
02/08/17	11:28	23.788	10.9	2.8	113.42	468
02/08/17	11:29	23.788	10.9	2.7	111.88	468

F = Unit Offline

E = Exceedance

I = Invalid

M = Maintenance

C = Calibration

S = Substituted

T = Out Of Control

# Average Data

Plant: HUNTINGTON PLANT

Interval: 1 Minute

Type: Block

Report Period: 02/08/2017 10:11 Through 02/08/2017 12:33

Time Online Criteria: 1 minute(s)

02/08/17	11:30	23.789	11.1	2.7	111.13	470
02/08/17	11:31	23.789	11.1	2.7	110.86	471
02/08/17	11:32	23.790	11.2	2.7	110.87	472
02/08/17	11:33	23.791	11.2	2.7	110.71	473
02/08/17	11:34	23.791	11.2	2.7	110.37	474
02/08/17	11:35	23.790	11.2	2.6	110.41	474
02/08/17	11:36	23.790	11.2	2.6	110.42	474
02/08/17	11:37	23.790	11.1	2.6	110.12	473
02/08/17	11:38	23.790	11.1	2.6	109.52	471
02/08/17	11:39	23.791	11.1	2.6	109.28	471
02/08/17	11:40	23.791	11.1	2.8	109.53	470
02/08/17	11:41	23.791	11.1	3.0	109.64	470
02/08/17	11:42	23.791	11.2	3.0	109.79	471
02/08/17	11:43	23.791	11.0	2.8	113.09	473
02/08/17	11:44	23.791	11.1	2.8	112.59	475
02/08/17	11:45	23.792	11.2	2.7	111.23	476
02/08/17	11:46	23.792	11.2	2.6	111.02	476
02/08/17	11:47	23.791	11.0	2.6	111.10	476
02/08/17	11:48	23.790	11.1	2.6	110.96	474
02/08/17	11:49	23.789	11.1	2.6	113.09	472
02/08/17	11:50	23.789	10.9	2.6	114.56	470
02/08/17	11:51	23.789	10.9	2.6	114.69	468
02/08/17	11:52	23.788	10.9	2.6	114.85	468
02/08/17	11:53	23.788	11.0	2.5	114.64	468
02/08/17	11:54	23.788	11.1	2.5	114.40	470
02/08/17	11:55	23.788	11.1	2.5	114.43	473
02/08/17	11:56	23.787	11.1	2.5	114.32	476
02/08/17	11:57	23.786	11.2	2.5	114.01	478
02/08/17	11:58	23.785	11.2	2.4	113.93	479
02/08/17	11:59	23.784	11.2	2.4	114.08	479
02/08/17	12:00	23.784	11.1 I	2.4	114.08	478
02/08/17	12:01	23.785	5.3 I	2.4	114.17	476
02/08/17	12:02	23.786	10.1 I	2.4	114.51	474
02/08/17	12:03	23.787	11.0 I	2.4	114.78	473
02/08/17	12:04	23.788	10.9 I	2.4	114.69	471
02/08/17	12:05	23.788	10.9 I	2.4	114.68	471
02/08/17	12:06	23.788	11.0	2.4	114.69	472
02/08/17	12:07	23.789	11.0	2.4	114.68	473
02/08/17	12:08	23.789	11.1	2.4	114.42	475
02/08/17	12:09	23.789	11.2	2.4	114.09	477
02/08/17	12:10	23.789	11.2	2.4	114.15	478

F = Unit Offline

E = Exceedance

I = Invalid

M = Maintenance

C = Calibration

S = Substituted

T = Out Of Control

# Average Data

Plant: HUNTINGTON PLANT

Interval: 1 Minute

Type: Block

Report Period: 02/08/2017 10:11 Through 02/08/2017 12:33

Time Online Criteria: 1 minute(s)

02/08/17	12:11	23.789	11.1	2.4	114.23	478
02/08/17	12:12	23.788	11.1	2.4	114.26	478
02/08/17	12:13	23.788	11.1	2.4	114.36	477
02/08/17	12:14	23.789	11.0	2.4	114.66	475
02/08/17	12:15	23.790	11.0	2.4	114.72	474
02/08/17	12:16	23.790	11.0	2.5	114.68	473
02/08/17	12:17	23.791	10.9	2.5	114.51	474
02/08/17	12:18	23.791	11.1	2.6	114.19	474
02/08/17	12:19	23.791	11.1	2.6	114.11	475
02/08/17	12:20	23.791	11.0	2.6	114.13	476
02/08/17	12:21	23.790	11.2	2.6	113.93	478
02/08/17	12:22	23.791	11.2	2.6	113.96	479
02/08/17	12:23	23.791	11.2	2.6	114.17	479
02/08/17	12:24	23.790	11.1	2.7	114.26	479
02/08/17	12:25	23.790	11.1	2.6	114.26	478
02/08/17	12:26	23.791	11.1	2.5	114.13	477
02/08/17	12:27	23.791	11.1	2.5	111.23	476
02/08/17	12:28	23.791	11.1	2.5	110.89	475
02/08/17	12:29	23.790	11.1	2.6	110.60	474
02/08/17	12:30	23.790	11.2	2.6	110.36	475
02/08/17	12:31	23.790	11.2	2.6	110.34	475
02/08/17	12:32	23.791	11.2	2.7	110.47	476
02/08/17	12:33	23.791	11.2	2.7	110.42	476

Average	23.785	11.1	2.7	112.74	475
Minimum	23.768	10.8	2.4	106.14	468
Maximum	23.792	11.3	3.3	115.14	481
Summation	3,401.284	1,518.8	388.9	16,122.19	67,882
Included Data Points	143	137	143	143	143
Total number of Data Points	143	143	143	143	143

F = Unit Offline

E = Exceedance

I = Invalid

M = Maintenance

Report Generated: 02/08/17 15:24

C = Calibration

S = Substituted

T = Out Of Control

# Average Data

Plant: HUNTINGTON PLANT

Interval: 1 Minute

Type: Block

Report Period: 02/08/2017 13:14 Through 02/08/2017 15:29

Time Online Criteria: 1 minute(s)

Source Parameter (Unit)	UNIT2				
	BARPRESS (INHG)	CO2 (PCT)	OPACITY (PCT)	STKTEMP (DEGF)	UNITLOAD (MW)
02/08/17 13:14	23.780	11.0	2.7	114.89	474
02/08/17 13:15	23.780	11.1	2.8	114.61	474
02/08/17 13:16	23.780	11.0	2.9	114.71	475
02/08/17 13:17	23.780	11.0	2.8	115.04	476
02/08/17 13:18	23.780	11.1	2.7	115.07	477
02/08/17 13:19	23.780	11.1	2.7	114.81	478
02/08/17 13:20	23.779	11.1	2.7	114.71	478
02/08/17 13:21	23.778	11.1	2.6	114.88	478
02/08/17 13:22	23.777	11.0	2.6	114.95	478
02/08/17 13:23	23.777	11.0	2.6	115.01	477
02/08/17 13:24	23.778	11.0	2.8	115.08	476
02/08/17 13:25	23.779	11.0	2.8	114.92	476
02/08/17 13:26	23.779	11.1	2.8	113.27	476
02/08/17 13:27	23.780	11.1	2.7	112.18	476
02/08/17 13:28	23.780	11.1	2.7	111.58	477
02/08/17 13:29	23.781	11.1	2.7	111.35	479
02/08/17 13:30	23.781	11.1	2.6	111.49	479
02/08/17 13:31	23.781	11.1	2.6	110.92	478
02/08/17 13:32	23.781	11.1	2.7	110.86	477
02/08/17 13:33	23.780	11.1	2.6	110.92	476
02/08/17 13:34	23.780	11.0	2.6	110.98	474
02/08/17 13:35	23.779	11.0	2.6	110.60	473
02/08/17 13:36	23.779	11.0	2.6	110.29	472
02/08/17 13:37	23.778	11.0	2.7	110.08	471
02/08/17 13:38	23.778	11.0	2.6	110.11	471
02/08/17 13:39	23.778	11.1	2.6	110.17	472
02/08/17 13:40	23.778	11.2	2.6	110.28	473
02/08/17 13:41	23.778	11.2	2.6	113.72	475
02/08/17 13:42	23.778	11.0	2.5	114.06	475
02/08/17 13:43	23.778	11.1	2.5	113.92	476
02/08/17 13:44	23.778	11.0	2.5	114.10	475
02/08/17 13:45	23.778	11.0	2.5	114.37	475
02/08/17 13:46	23.778	11.0	2.5	114.57	474
02/08/17 13:47	23.777	11.0	2.5	114.66	473
02/08/17 13:48	23.777	11.0	2.5	114.49	473
02/08/17 13:49	23.776	11.0	2.5	114.50	473
02/08/17 13:50	23.776	11.0	2.6	114.59	473
02/08/17 13:51	23.776	11.0	2.8	114.64	473

F = Unit Offline

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# Average Data

Plant: HUNTINGTON PLANT

Interval: 1 Minute

Type: Block

Report Period: 02/08/2017 13:14 Through 02/08/2017 15:29

Time Online Criteria: 1 minute(s)

02/08/17	13:52	23.777	11.0	2.9	114.75	473
02/08/17	13:53	23.777	11.0	2.8	114.82	475
02/08/17	13:54	23.778	11.0	2.7	114.89	477
02/08/17	13:55	23.778	11.1	2.7	114.73	478
02/08/17	13:56	23.778	11.1	2.6	114.71	479
02/08/17	13:57	23.778	11.1	2.5	115.09	479
02/08/17	13:58	23.778	11.0	2.5	115.26	478
02/08/17	13:59	23.777	11.0	2.6	115.21	477
02/08/17	14:00	23.777	11.0	2.6	115.19	475
02/08/17	14:01	23.777	11.0	2.8	115.19	473
02/08/17	14:02	23.776	10.9	3.0	115.25	472
02/08/17	14:03	23.776	11.0	3.0	115.49	472
02/08/17	14:04	23.776	10.8	2.8	115.75	472
02/08/17	14:05	23.776	10.9	2.8	115.65	473
02/08/17	14:06	23.775	11.0	2.8	115.37	474
02/08/17	14:07	23.774	11.0	2.8	115.30	475
02/08/17	14:08	23.774	10.9	2.7	115.40	475
02/08/17	14:09	23.773	11.1	2.7	115.37	475
02/08/17	14:10	23.773	11.0	2.7	115.41	474
02/08/17	14:11	23.772	10.9	2.7	115.63	472
02/08/17	14:12	23.772	10.9	2.7	115.76	471
02/08/17	14:13	23.772	10.9	2.8	115.68	469
02/08/17	14:14	23.773	10.9	2.7	115.45	468
02/08/17	14:15	23.774	10.9	2.7	115.43	468
02/08/17	14:16	23.774	10.9	2.7	115.33	469
02/08/17	14:17	23.774	11.0	2.7	114.95	470
02/08/17	14:18	23.773	11.0	2.7	114.93	471
02/08/17	14:19	23.772	11.0	2.7	114.89	472
02/08/17	14:20	23.771	11.0	2.7	114.74	474
02/08/17	14:21	23.770	11.1	2.6	114.69	475
02/08/17	14:22	23.771	11.1	2.6	114.73	476
02/08/17	14:23	23.771	11.1	2.6	115.00	476
02/08/17	14:24	23.770	11.1	2.6	114.95	476
02/08/17	14:25	23.770	11.1	2.6	113.27	476
02/08/17	14:26	23.770	11.1	2.6	111.57	476
02/08/17	14:27	23.771	11.1	2.6	111.11	476
02/08/17	14:28	23.771	11.1	2.6	110.89	476
02/08/17	14:29	23.772	11.2	2.5	110.98	476
02/08/17	14:30	23.771	11.1	2.6	110.97	476
02/08/17	14:31	23.770	11.1	2.5	110.67	476
02/08/17	14:32	23.769	11.1	2.4	110.64	476

F = Unit Offline

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T = Out Of Control

# Average Data

Plant: HUNTINGTON PLANT

Interval: 1 Minute

Type: Block

Report Period: 02/08/2017 13:14 Through 02/08/2017 15:29

Time Online Criteria: 1 minute(s)

02/08/17	14:33	23.769	11.1	2.4	110.69	475
02/08/17	14:34	23.770	11.0	2.4	110.58	475
02/08/17	14:35	23.771	11.1	2.4	110.10	475
02/08/17	14:36	23.771	11.1	2.4	109.20	475
02/08/17	14:37	23.771	11.1	2.4	109.07	474
02/08/17	14:38	23.771	11.1	2.4	109.43	475
02/08/17	14:39	23.771	11.1	2.4	109.69	476
02/08/17	14:40	23.770	11.1	2.4	113.07	476
02/08/17	14:41	23.770	11.1	2.4	113.42	477
02/08/17	14:42	23.770	11.2	2.3	113.49	477
02/08/17	14:43	23.770	11.1	2.3	113.71	477
02/08/17	14:44	23.771	11.0	2.3	113.79	477
02/08/17	14:45	23.772	11.0	2.3	114.01	477
02/08/17	14:46	23.773	11.0	2.3	114.25	476
02/08/17	14:47	23.773	11.0	2.3	114.28	475
02/08/17	14:48	23.772	10.9	2.3	114.45	475
02/08/17	14:49	23.772	10.9	2.2	114.55	474
02/08/17	14:50	23.772	11.0	2.3	114.46	474
02/08/17	14:51	23.772	11.0	2.4	114.41	474
02/08/17	14:52	23.773	11.0	2.3	114.28	475
02/08/17	14:53	23.774	11.0	2.3	114.18	475
02/08/17	14:54	23.774	11.0	2.3	114.36	476
02/08/17	14:55	23.774	11.0	2.3	114.30	475
02/08/17	14:56	23.774	11.0	2.2	114.18	475
02/08/17	14:57	23.774	11.0	2.2	114.16	475
02/08/17	14:58	23.774	11.0	2.3	114.23	475
02/08/17	14:59	23.774	11.0	2.2	114.30	475
02/08/17	15:00	23.774	10.9	2.2	114.44	474
02/08/17	15:01	23.774	10.9	2.3	114.57	473
02/08/17	15:02	23.774	10.9	2.2	114.40	473
02/08/17	15:03	23.774	11.0	2.3	114.08	473
02/08/17	15:04	23.774	11.0	2.2	113.98	474
02/08/17	15:05	23.773	11.0	2.2	114.03	475
02/08/17	15:06	23.773	11.1	2.3	114.05	476
02/08/17	15:07	23.773	11.1	2.3	114.15	477
02/08/17	15:08	23.774	11.0	2.3	114.28	477
02/08/17	15:09	23.775	11.1	2.3	114.24	478
02/08/17	15:10	23.776	11.1	2.3	114.38	478
02/08/17	15:11	23.776	11.0	2.3	114.46	477
02/08/17	15:12	23.776	11.0	2.3	114.59	477
02/08/17	15:13	23.777	11.0	2.3	114.90	476

F = Unit Offline

E = Exceedance

I = Invalid

M = Maintenance

C = Calibration

S = Substituted

T = Out Of Control

# Average Data

Plant: HUNTINGTON PLANT

Interval: 1 Minute

Type: Block

Report Period: 02/08/2017 13:14 Through 02/08/2017 15:29

Time Online Criteria: 1 minute(s)

02/08/17	15:14	23.777	10.9	2.3	114.69	476
02/08/17	15:15	23.777	11.0	2.3	114.58	476
02/08/17	15:16	23.777	11.0	2.3	114.60	476
02/08/17	15:17	23.776	11.0	2.3	114.60	476
02/08/17	15:18	23.775	10.9	2.3	114.75	476
02/08/17	15:19	23.775	11.0	2.3	114.13	475
02/08/17	15:20	23.776	11.0	2.3	112.02	475
02/08/17	15:21	23.776	11.1	2.3	111.06	476
02/08/17	15:22	23.776	11.1	2.3	110.99	476
02/08/17	15:23	23.776	11.0	2.3	111.16	476
02/08/17	15:24	23.775	11.0	2.3	111.18	476
02/08/17	15:25	23.775	11.0	2.3	110.96	476
02/08/17	15:26	23.775	11.0	2.3	110.82	475
02/08/17	15:27	23.775	11.0	2.3	110.99	474
02/08/17	15:28	23.775	11.0	2.3	110.78	474
02/08/17	15:29	23.775	11.0	2.3	110.10	474

Average	23.775	11.0	2.5	113.54	475
Minimum	23.769	10.8	2.2	109.07	468
Maximum	23.781	11.2	3.0	115.76	479
Summation	3,233.408	1,499.5	341.6	15,441.07	64,597

Included Data Points	136	136	136	136	136
Total number of Data Points	136	136	136	136	136

F = Unit Offline

E = Exceedance

I = Invalid

M = Maintenance

Report Generated: 02/08/17 15:32

C = Calibration

S = Substituted

T = Out Of Control





**Project PC17-0001**

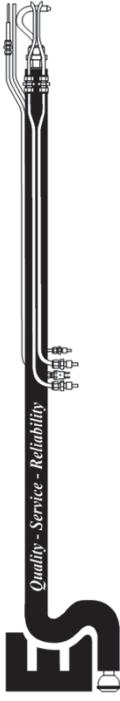
**Appendix E: Calibration Information**

Dry Gas Meter Pre-Test and Post-Test Calibrations

Critical Orifice Calibration Certificate

AETB Certification

## METHOD 5 DRY GAS METER CALIBRATION USING CRITICAL ORIFICES



- 1) Select three critical orifices to calibrate the dry gas meter which bracket the expected operating range.
- 2) Record barometric pressure before and after calibration procedure.
- 3) Run at tested vacuum (from Orifice Calibration Report), for a period of time necessary to achieve a minimum total volume of 5 cubic feet.
- 4) Record data and information in the **GREEN** cells, **YELLOW** cells are calculated.

DATE:	9/21/2016	METER SERIAL #:	16025473
METER ID #:	M5.3	CRITICAL ORIFICE SET SERIAL #:	1531S

INITIAL BAROMETRIC PRESSURE (in Hg): **24.51** FINAL AVG (P<sub>bar</sub>) **24.505**

ORIFICE #	RUN #	K' FACTOR	TESTED VACUUM (in Hg)	TEMPERATURES °F				DGM θ	DGM ΔH (in H <sub>2</sub> O)	V <sub>m</sub> (STD)	V <sub>cr</sub> (STD)	Y	Y % Diff to Average Y	Y % Diff with other orifices	ΔH @		
				AMBIENT	DGM INLET	DGM OUTLET	INITIAL FINAL										
<b>23</b>	1	0.6363	17	77.837	82.032	4.195	76	74	74	74	74.25	5.00	1.8	<u>3.4145</u>	<u>3.3684</u>	<u>0.987</u>	
	2	0.6363	17	82.932	86.225	4.193	76	75	76	74	74.75	5.00	1.8	<u>3.4097</u>	<u>3.3694</u>	<u>0.988</u>	
	3	0.6363	17	86.225	90.455	4.230	77	76	76	74	75.25	5.00	1.8	<u>3.4366</u>	<u>3.3653</u>	<u>0.979</u>	
<b>18</b>	1	0.5004	17.5	90.470	93.758	3.288	77	76	76	75	75.5	5.00	1.1	<u>2.6645</u>	<u>2.6466</u>	<u>0.993</u>	
	2	0.5004	17.5	93.758	97.052	3.294	77	76	76	75	75.5	5.00	1.1	<u>2.6893</u>	<u>2.6466</u>	<u>0.991</u>	
	3	0.5004	17.5	97.052	100.340	3.288	77	76	77	75	75.75	5.00	1.1	<u>2.6632</u>	<u>2.6466</u>	<u>0.994</u>	
<b>12</b>	1	0.3193	19.5	100.340	102.464	2.124	77	77	77	75	76	76.25	5.00	0.45	<u>1.7154</u>	<u>1.6887</u>	<u>0.984</u>
	2	0.3193	19.5	102.464	104.590	2.126	77	77	77	75	76	76.25	5.00	0.45	<u>1.7171</u>	<u>1.6887</u>	<u>0.984</u>
	3	0.3193	19.5	104.590	106.715	2.125	77	74	74	76	74.5	74.5	5.00	0.45	<u>1.7219</u>	<u>1.6887</u>	<u>0.981</u>

### USING THE CRITICAL ORIFICES AS CALIBRATION STANDARDS:

The following equations are used to calculate the standard volumes of air passed through the DGM, V<sub>σ</sub> (std), and the critical orifice, V<sub>cr</sub> (std), and the DGM calibration factor, Y. These equations are automatically calculated in the spreadsheet above.

$$\text{AVERAGE DRY GAS METER CALIBRATION FACTOR, Y} = \frac{0.9868}{\text{AVERAGE } \Delta H_{@} = 1.80}$$

$$(1) \quad Vm_{(std)} = K_1 * Vm * \frac{Pbar + (\Delta H / 13.6)}{Tm} = \text{Net volume of gas sample passed through the DGM, corrected to standard conditions}$$

$$K_1 = 17.64 \text{ °Rin. Hg (English), 0.3858 K/mm Hg (Metric)}$$

$$T_m = \text{Absolute DGM avg. temperature (R - English, °K - Metric)}$$

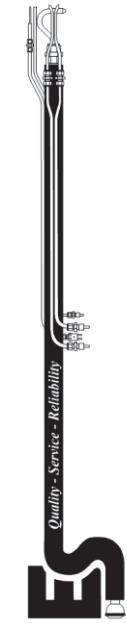
$$K' = \text{Average K factor from Critical Orifice Calibration}$$

$$(2) \quad Vcr_{(std)} = K' * \frac{Pbar * \Theta}{\sqrt{Tamb}} = \text{Volume of gas sample passed through the critical orifice, corrected to standard conditions}$$

$$T_{amb} = \text{Absolute ambient temperature (R - English, °K - Metric)}$$

$$Y = \frac{Vcr_{(std)}}{Vm_{(std)}} = \text{DGM calibration factor}$$

## METHOD 5 DRY GAS METER CALIBRATION USING CRITICAL ORIFICES



**EMCO**

EMISSIONS MEASUREMENT COMPANY

### ENVIRONMENTAL SUPPLY COMPANY

DATE:	2.9.17	METER SERIAL #:	17465146
METER ID #:	M5-3	CRITICAL ORIFICE SET SERIAL #:	1531s

		BAROMETRIC PRESSURE (in Hg):		INITIAL	FINAL	AVG (P <sub>bar</sub> )
				24.33	24.33	24.33

ORIFICE #	RUN #	TESTED VACUUM (in Hg)		DGM READINGS (FT <sup>3</sup> )		TEMPERATURES °F		ELAPSED TIME (MIN) θ	DGM ΔH (in H <sub>2</sub> O)	(1) V <sub>m</sub> (STD)	(2) V <sub>c</sub> (STD)	(3) Y	Y % Diff to Average Y	Y % Diff with other orifices	ΔH @
		K'	FACTOR (AVG)	INITIAL	FINAL	AMBIENT	DGM INLET								
						INITIAL	FINAL			NET (V <sub>m</sub> )					
<b>23</b>	1	0.6366	14	363.415	367.464	4.049	61	61	63	59	60	60.75	5.00	1.8	<b>3.3572</b>
	2	0.6366	14	367.464	371.502	4.038	61	63	63	60	60	61.5	5.00	1.8	<b>3.3432</b>
	3	0.6366	14	371.502	375.523	4.021	62	63	64	60	61	62	5.00	1.8	<b>3.3260</b>
<b>18</b>	1	0.4976	15	379.413	383.195	3.782	62	64	64	61	62	62.75	6.00	1.1	<b>3.1172</b>
	2	0.4976	15	383.195	386.351	3.156	62	64	65	62	63	63.5	5.00	1.1	<b>2.5975</b>
<b>16</b>	1	0.4449	15.5	386.351	389.168	2.817	62	65	65	63	63	64	5.00	0.9	<b>2.3149</b>
	2	0.4449	15.5	389.168	392.010	2.842	62	65	65	63	63	64	5.00	0.9	<b>2.3314</b>
															<b>AVG = 1.0119</b>

### USING THE CRITICAL ORIFICES AS CALIBRATION STANDARDS:

The following equations are used to calculate the standard volumes of air passed through the DGM, V<sub>m</sub>(std), and the critical orifice, V<sub>c</sub>(std), and the DGM calibration factor, Y. These equations are automatically calculated in the spreadsheet above.

### AVERAGE DRY GAS METER CALIBRATION FACTOR, Y = **1.0182**

### INITIAL DRY GAS METER CALIBRATION FACTOR, Y = **1.0008**

### % DIFFERENCE = **1.74%** (Must be <5%)

$$\Delta H @ = \left( \frac{0.75 \varnothing}{V_m(\text{std})} \right)^2 \Delta H \left( \frac{V_m(\text{std})}{V_m} \right)$$

### AVG = **1.83**

### INITIAL DRY GAS METER CALIBRATION FACTOR, Y = **1.0200**

### % DIFFERENCE = **1.74%** (Must be <5%)

$$\Delta H @ = \left( \frac{0.75 \varnothing}{V_c(\text{std})} \right)^2 \Delta H \left( \frac{V_c(\text{std})}{V_m} \right)$$

### AVG = **1.0119**

40 CFR Part 60 Appendix A-1 Method 2410.3: Temperature Sensors. After each field use, calibrate thermocouples at a temperature within 10% of the average absolute stack temperature. A reference thermocouple and potentiometer (calibrated against NIST standards) may be used. The absolute temperature measured with the sensor being calibrated and the reference sensor must agree within 1.5%.

### Thermocouple Calibration (using NIST-Traceable PIE Model 520 Calibrator)

Reference Value:	250
Console Value:	251
Percent Difference:	0.4%
Acceptance Criteria:	±1.5%

### Calibration Certificate

Practical Instrument Electronics Tel: (888) 872-9650 • Fax: (609) 872-9656	S/N 107078
<b>CERTIFICATE OF CALIBRATION</b>	
This is to certify that your instrument has been calibrated using standards whose accuracies are traceable to the National Institute of Standards and Technology (formerly NBS) within the limits of the NIST Calibration Services. Actual records pertaining to these standards are on file and are available for examination.	
Certified by: Practical Instrument Electronics Recommended Recalibrator: Arminy	
Model Number: 520-K	Serial No.: _____
Calibration Date: 02-03-09	Calibration Technique: S. Hall
In Service Date: _____	Calibration Due: _____

## METHOD 5 CRITICAL ORIFICE CALIBRATION



**CRITICAL ORIFICE SET S/N: 1531s**

DATE: January 8, 2016

REFERENCE DRY GAS METER  
SERIAL NUMBER: 16300942  
CALIBRATION FACTOR, Yc: 0.991

LEAK CHECK: Passed

ORIFICE #	RUN #	CRITICAL VACUUM (in Hg)	TESTED VACUUM (in Hg)	Barometric Pressure per Orifice AVG (Pa <sub>bar</sub> )		DGM READINGS (ft <sup>3</sup> )		TEMPERATURES °F		DGM OUTLET AVG	DGM AH (in H <sub>2</sub> O)	K' FACTOR (english)	K' FACTOR (metric-liters)	K' FACTOR (metric-m <sup>3</sup> )	K' FACTOR VARIATION (%)		
				INITIAL	FINAL	NET (V <sub>d</sub> )	DGM INLET	INITIAL	FINAL								
31	1	15	17.5	67.132	73.855	6.723	70.9	74.3	74.3	74.5	74.35	6.00	4.12	0.8535	0.7092	7.0921E-04 -0.04	
	2	15	17.5	73.855	80.552	6.727	70.9	74.3	74.1	74.3	74.3	6.00	4.12	0.8542	0.7098	7.0976E-04 0.04	
23	1	15	18	80.582	86.457	5.875	71.0	74.2	74.0	74.3	74.3	74.20	7.00	2.29	0.6367	0.5290	5.2903E-04 0.01
	2	15	18	86.457	92.331	5.874	70.9	74.0	73.9	74.3	74.3	74.13	7.00	2.29	0.6366	0.5290	5.2897E-04 -0.01
18	1	15	18	92.331	97.558	5.257	71.0	74.1	74.1	74.4	74.4	74.25	8.00	1.44	0.4974	0.4133	4.1330E-04 -0.05
	2	15	18	97.558	102.850	5.262	70.9	74.0	74.0	74.4	74.4	74.20	8.00	1.44	0.4979	0.4137	4.1370E-04 0.05
16	1	15	18	102.850	108.733	5.883	71.1	74.1	74.1	74.5	74.5	74.30	10.00	1.15	0.4450	0.3698	3.6975E-04 0.03
	2	15	18	108.733	114.613	5.880	71.1	74.1	74.1	74.5	74.5	74.30	10.00	1.15	0.4447	0.3696	3.6956E-04 -0.03
12	1	15	18	114.613	119.720	5.107	71.1	74.0	73.8	74.5	74.5	74.20	12.00	0.58	0.3215	0.2672	2.6716E-04 -0.06
	2	15	18	119.720	124.833	5.113	71.1	73.8	74.1	74.4	74.5	74.20	12.00	0.58	0.3219	0.2675	2.6747E-04 0.06

### USING THE CRITICAL ORIFICES AS CALIBRATION STANDARDS:

Calculate the standard volumes of air passed through the DGM and the critical orifices, and calculate the DGM calibration factor, Y, using the equations in US EPA Method 5, Section 7.2.3 (these equations are programmed on the spreadsheet included with each orifice set).

K' = Critical orifice coefficient,

Critical Orifice Set number 1531s was calibrated in accordance with the Code of Federal Regulations, Title 40, Part 60, Appendix A, Method 5, Section 7.2.

[(ft<sup>3</sup>)°R]<sup>1/2</sup>]/[(in.Hg)(min.)] - English Units  
[(liters)°K]<sup>1/2</sup>]/[(mm Hg)(min.)] - Metric-Liters Units  
[(m<sup>3</sup>)°K]<sup>1/2</sup>]/[(mm Hg)(min.)] - Metric Units

John B. L.  
Signature  
Date

**RE: Certification of Air Emission Testing Body (AETB) Conformance**

To Whom it May Concern:

This letter is to confirm that Emissions Measurement Company LLC ("EMCo") is an Air Emission Testing Body (AETB) operating in conformance with ASTM D7036-04, as required by 40 CFR Part 75, Appendix A §6.1.2. The table below lists the EPA Reference Methods for which each listed Project Manager is a Qualified Individual and other relevant information required by (as applicable) 40 CFR Part 75.59(a)(15), 40 CFR Part 75.59(b)(6) and 40 CFR Part 75.59(d)(4).

<b>Emissions Measurement Company (800) 984-9883</b>					
<b>AETB Qualified Individual Information</b>					
QI Name	QI Email	Exam*	Exam Date	Exam Provider	Provider Email
<b>Andrew Bruning</b>	abruning@stacktest.us	SES Group 1	6/12/2014	SES	QSTIprogram@gmail.com
		SES Group 2	9/18/2015		
<b>Will Stangroom</b>	wstangroom@stacktest.us	SES Group 3	6/12/2015	Ohio-Lumex	andrew.mertz@ohiolumex.com
		EPA Method 30B	1/16/2015*		
<b>Craig Kormylo</b>	ckormylo@stacktest.us	SES Group 1	8/2/2016	SES	QSTIprogram@gmail.com
<b>Matthew Parks</b>	mparks@stacktest.us	SES Group 1	2/5/2016	SES	QSTIprogram@gmail.com
		SES Group 2	9/18/2015		
		SES Group 3	2/5/2016		

\*The Source Evaluation Society (SES) Group 1 Exam includes EPA Reference Methods 1, 1A, 2, 2A, 2C, 2D, 2F, 2G, 2H, 3, 3B, 4, 5, 5A, 5B, 5D, 5E, 5F, 5I, 17, 19, 201A and 202. The SES Group 2 Exam includes EPA Reference Methods 1 , 2, 3, 4, 3B, 6, 6A, 6B, 7, 7C, 7D, 8, 11,13A, 13B, 15A, 16A, 19, 26, 26A and 202. The SES Group 3 Exam includes EPA Reference Methods 3A, 6C, 7E, 10, 10B, 20, 25A, 40 CFR Part 60 Performance Specifications 2 – 8, 15 and 40 CFR Part 75. Initial 30B training provided by Ohio-Lumex; refresher exam administered by EMCo once every five years.

Please feel free to contact me with any questions regarding the above.



Matthew Parks  
Technical Director